Preparing for a Terrorist Attack: Mass Casualty Management

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Introduction

As the country prepares for a possible terrorist attack, communities, businesses, hospitals, elected officials, and children in schools want to know whether they are safe. Can communities protect its citizens from attack? Can hospitals care for biological casualties? Is there a greater threat on the horizon in the form of smallpox or SARS[1]? What can the individual do to protect their home or their family?

It is a reality that, in the event of a mass casualty event, EMS and fire services will not be immediately able to meet the needs of most victims in office buildings, malls, schools, and other soft targets. If several sites are attacked at one time, if a cloud of chemicals or biologic particles blankets a city, first responders will have a response capacity that is limited by personnel resources.

Every potential target must review its current capabilities and assets. Soft targets must take steps to reduce exposure and harm after a terrorist attack. In addition, soft targets must have an internal response capacity that will offer support without the intervention of first responders. Schools, large employers, high rise buildings, military garrisons, athletic arenas, and shopping malls must not only work with the community to support mass casualty plans, but must also develop their own response resources. Our communities must develop plans that enable a vigorous, coordinated, and efficient response from police, fire, and EMS and take advantage of the resources available to industry and the public.

First responder assets (fire, police, HazMat, EMS), hospitals, healthcare workers, and state and regional agencies (Red Cross, Public Health, and Emergency Management) will participate in the community's response to a terrorist attack. The roles of each

participant should be specifically described in the community's response plan: a consensus document.

Threat

In the past decade, the intentional release of hazardous chemicals by the Aum Shinrikyo in Japan alerted the world's governments about the threat of mass casualties from chemical exposure. Although the Aum Shinrikyo released anthrax and botulinum toxin without lethal effect, the recent successful use of anthrax as a biologic terror weapon in 2001 epitomizes the ruthlessness and effectiveness of biologic warfare. Chemical weapons used in Moscow, Ricin found in London and Paris, and the threat of nuclear weapons on the Korean Peninsula, South Asia, and Iran complicate these preparations.

There is a very long list of weapons that the terrorist might employ, but the resources with which the community might respond to these threats are finite.

Communities should approach this opportunity to improve preparedness in an "all-threat" or "all-hazards" approach.

The first step: focus on community chemical preparedness. There is a considerable 24-hour risk from exposure to hazardous chemicals utilized by local industry, transported by rail or truck, sold in hardware stores and grocery stores, and stored on the shelves of our homes.

It is essential that all first responders have the appropriate training and equipment to enable them to operate safely in a potentially hazardous response zone.

In addition, individual businesses, schools, and homes must have plans and equipment in place to decrease the possibility of exposure to these hazards.

A Four Part Plan for Mass Casualties

1. Hospital: A Minimum level of Preparedness
2. Awareness Training: Hospitals, laboratories, public health, first responders
3. Community Preparedness
4. Off-site Treatment Capability

Hospital Response to Terrorism: A Minimum Level of Preparedness

Hospitals have a community responsibility to offer care to injured HazMat victims.[2-4] In some cases, the injury might be a result of an exposure to a hazardous chemical or infectious hazard. No matter the source of the injury, accidental or intentional, whether it occurs at work, at home, or on the road, the hospital must have the capacity to safely assess for injuries and to safely offer care. This responsibility extends to the victims of a terrorist attack.[5]

A reasonable and cost-effective approach should enable any hospital with an emergency department to reliably and safely care for victims of a HazMat or terrorist event 24 hours a day, 7 days a week. This preparedness should include policies that protect employees, victims, the institution, and the environment.

The hospital should, at the very minimum, be prepared to handle AT LEAST ONE PATIENT EXPOSED TO A HAZARDOUS MATERIAL.[4, 5] If a hospital is prepared for a defined minimum level of risk, then these policies and systems can be used to treat the vast majority of exposures. These systems can be expanded to include the management of mass casualties. Response plans should enable victims to self-decontaminate and thus more efficiently utilize response assets and decrease potential harm to victims. Plan for a few and train for many. Training for hospitals is available.[6]

Chem/Explosives/Radiation: The Sentinel Event

It is important to distinguish between attacks that cause sudden, overt, recognizable injuries--"sentinel events"[2, 4, 7-9]--and those that cause delayed injuries. Attacks using explosives and chemicals generally present as an overt sentinel event with associated “lights and sirens” community response and multiple injuries. The victims and the community will know with certainty that an attack has taken place. A biologic attack will have more delayed effects.

After a sentinel or overt event, it is difficult to rapidly prove that chemicals have NOT been used in the initial moments after an attack. Community and hospital responders must initially assume victims are contaminated. The system must be prepared to protect responders and health facilities from exposure to the “unknown chemical.”

Since it is impossible to determine with certainty whether or not the victims have been contaminated, a Minimum Level of Decontamination must be defined. Victims from a sentinel event should not be allowed to enter an adjacent building, bus, ambulance, or the medical center without the removal of clothing. Removal of clothing is the essential first step in the treatment of the contaminated victim. Once the clothing has been removed, the victim will remove 80 to 90% of the contaminant after liquid contamination and nearly 100% after vapor contamination. *This may be the only decontamination procedure that is required for those victims exposed to a chemical (in the form of a gas or vapor) or biologic weapon.*

Officials and decision-makers at schools, high-rise buildings, businesses, military garrisons, and other soft targets can develop the capacity to encourage worried-well and minimally injured survivors to remove their clothing. Clothing removal remains a reliable form of initial gross decontamination. A dry decon kit, such as the Doff-It Kit, will enable the victim to remove their clothing in public without the help of first responders.

Some patients, after a clinical assessment, might require a soap and water shower if liquid or solid exposure is observed or suspected. The decontamination facility or shower[6] should enable decon for both ambulatory and non-ambulatory victims.

Biologic Attacks

In October and November 2001, the US suffered numerous casualties due to exposure to a highly lethal strain of *Bacillus anthracis* or anthrax. Recently, the threat of an attack utilizing the highly infectious smallpox virus resulted in the production of vast stores of smallpox vaccine: enough to vaccinate the entire US population. Plans are under way, at the behest of President Bush, to plan vaccination of emergency personnel and first responders. Most recently, President Bush has approved quarantine for victims of SARS.[1]

Hospitals, public health departments, laboratories, and first responders should receive adequate awareness training on the medical consequences of a biologic attack. Every level of worker should have a clear understanding of this threat and the community or statewide plan to respond to this threat. This is important so that:

- Essential workers will go to work after a biologic attack
- Workers understand that reasonable personal protective equipment is available and effective enough to protect them after a Bio attack.
- Workers understand that, if antibiotics or vaccines are required after Bio attack, the employer will be able to deliver these necessary medication most reliably from their place of work (hospital workers and first responders)

Mass Casualty Plan

All communities must have a rational plan to manage casualties after a mass casualty event: it is a matter of national security.[2] The plan should be designed to organize community response resources so that they can be efficiently utilized after a mass casualty incident (MCI). The plan should be generic in scope so that it can be used as a routine planning document to respond to natural events such as storms, tornadoes, hurricanes, floods, and earthquakes, community HazMat releases, and terrorist attacks.

This plan, formulated with input from public health, homeland security, emergency management, fire, public health, EMS, police, and the hospital community should enable a 24-hour response utilizing existing personnel. Since this threat rarely has a warning, planning should include table-top and hands-on realistic exercises. The community response requires a rapid and organized response.

The mass casualty plan must reasonably delineate protocols and procedures for delivering appropriate care to (1) the critically injured, (2) the ambulatory minimally-injured and (3) worried-well survivors. It is essential that the plan address all three clinical groups. The ambulatory victims make up 80-90% of survivors and will likely overwhelm hospital and EMS resources. A mass casualty management and enhanced triage plan can direct these patients away from the hospital and towards a lower level of assessment and care. This necessary triage will enable hospitals to care for the more critically injured survivors. There are very few beds available for treatment of the critically ill in the emergency department. These beds should be reserved for those survivors that require an advanced level of medical care.

State-wide efforts to respond to a terrorist attack will require the support of immunity legislation to protect those who would mitigate against, respond to, and triage victims after a mass casualty incident. These triage efforts require creative and aggressive efforts to maximize the efficiency of the community response.

The plans should complement the safety requirements described in OSHA's HAZWOPER 1910.120 standards.[10] The OSHA requirements apply to EMS, fire, police, and hospital personnel.[9, 11]

The mass casualty plan will enable a cost-effective and manpower-efficient response to the attack. The plan is divided into:

- The Scene: Identify and harden soft targets

- The Response Zone: Improve triage for a more efficient response
- The Hospital: Mandate a minimum level of preparedness

THE SCENE

Potential terrorist targets are often called "soft targets" due to the inherent minimal security precautions undertaken by most large employers, schools, athletic arenas, and transportation facilities. These soft targets have a significant capacity to participate in the community response. Even hardened targets like airports and military garrisons are vulnerable to chemical and biologic releases and are thus treated similarly to other soft targets.

Identify security personnel in charge of these facilities. Include these personnel in the community plan and the response. After an attack or an event that causes mass casualties, in many cases, response by EMS and Fire will be delayed due to exceptional demand. Soft targets should develop a response plan that assumes an extended period in which they must act on their own. Consider placing specific disaster equipment at these potential sites so that they might have the capacity to decontaminate ambulatory survivors prior to the arrival of first responders. Industrial security professionals can improve terrorism and mass casualty preparedness for their facilities by:

- Exercising evacuation plans.
- Enabling on-site self-decontamination (Dry Decon Kits, Doffit Kits)[12]
- Practicing and enabling shelter-in-place maneuvers.
- Utilizing N-95 or N-100 masks
- Improving personal protection for personnel handling the mail.
- Establishing a one-switch capability to control air-handling equipment.
- Revise and protect air intake equipment and understand the consequences of these actions[13, 14]
- Elevate air intakes as high as practical[13, 14]
- Understand the capabilities of the air handling system[13, 14]

THE RESPONSE ZONE

Alter triage to enable utilization of off-site treatment shelters or Secondary Assessment Centers (SAC). The SAC will have the capacity to receive ambulatory minimally injured victims after an overt attack or Bio victims after a Bio attack in which hospitals have been overwhelmed. The SAC's will have the capacity to manage large numbers of minimally injured or non-injured as tornados, earthquakes, floods, and hurricanes. Utilize off-site treatment areas to preserve the hospital capabilities for the treatment of the critically ill. This will require that each state legislature pass laws that offer immunity to first responder and hospital triage personnel to protect them from malpractice and civil litigation. Transfer the ambulatory survivors by bus or non-ambulance transport vehicle away from the site of the attack. Prior to transfer, minimal decontamination must occur. Offer ambulatory minimally ill and worried-well survivors dry decon kits or Doffit Kits[12] that will enable them to self-decontaminate.

THE HOSPITAL

All hospitals that have a 24-hour emergency department must have the capacity to safely assess, decontaminate, and treat victims exposed to a hazardous material.[5] Once this minimum level of

preparedness has been achieved, expansion of services to include mass casualties can be performed in a rapid and reasonable fashion. Hospitals do not have the capacity to manage mass casualties. Thus, communities and public health systems must plan to offer treatment to victims in off-site treatment shelters or secondary assessment centers. The management of mass casualties after a terrorist attack is not merely a hospital problem; it is a community problem.

TRAINING

Comprehensive awareness training for all first responders, hospital personnel, health department and emergency management agency personnel, and private security will require a combination of on-site training, tabletop drills, and internet training. In particular, hospital HazMat training must be delivered on-site with members of the decon team trained to the OSHA Operations Level.

Dry Decon: A Mass Casualty Decontamination Alternative

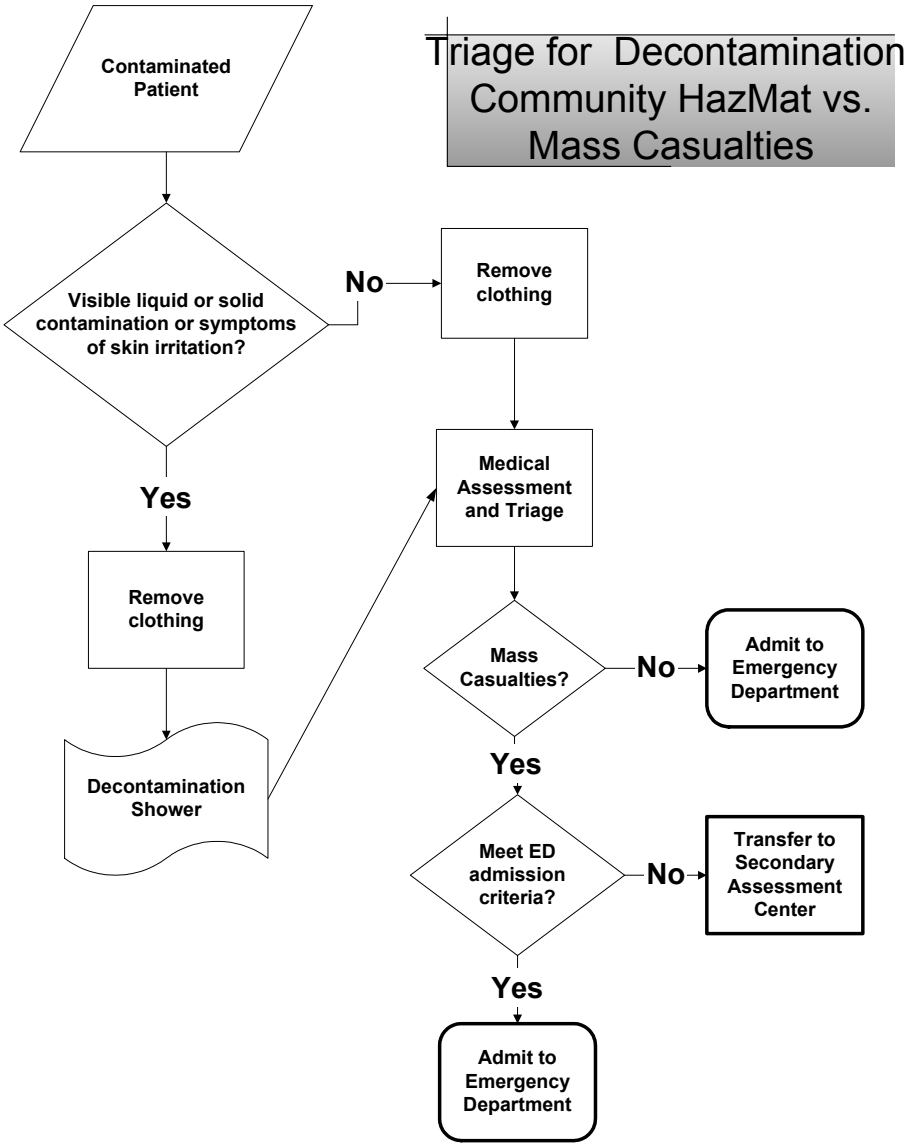
Personal decon kits[12, 15] enable HazMat victims to remove clothing, in public, without unnecessary exposure to cameras or other observers. These kits provide an inexpensive and reliable alternative to wet decon, decrease the need for mandatory shower decon, expand decon capability at the scene of the attack and the hospital, and enable a more efficient response to a mass casualty attack.

Mass casualty HazMat exposures, according to historical sources, usually involve chemicals in the form of vapor or gas. Experience has shown that in such incidents 80-90% of the survivors are ambulatory.[16] Ambulatory survivors can have minimal to severe symptoms. In addition, survivors who are ambulatory and exhibit no symptoms but who are worried that they might have been exposed are referred to as the "worried-well."

The major goal for responding agencies is to quickly identify, evacuate, decontaminate, and treat those victims with obvious exposure to the hazard and with significant injuries. Although water decon is optimal, after a mass casualty attack it will be very difficult to provide timely treatment to the critically ill if water decon, which is heavily reliant upon large manpower and equipment resources, is directed towards the ambulatory survivors with minimal or no symptoms.

Evacuation of victims and removal of their clothing has been proven to be the most important and effective means of decon because nearly all of the contaminant will be in the clothing. This is a reasonable and minimally acceptable level of decontamination. A report from the U.S. Army[16] noted "since the most important aspect of decontamination is the timely and effective removal of the agent, the precise methods used to remove the agent are not nearly as important as the speed by which the agent is removed."

For community or routine HazMat exposures, the personal decon kit or Doffit Kit[12] enables the victim to remove clothing prior to or instead of water decontamination. After liquid or solid HazMat contamination, the removal of clothing will remove 80% or more of the contaminant. This might provide some protection for these patients as they await water decon. These kits enable the victims to rapidly remove their clothing while waiting for water decon.
For mass casualty HazMat incidents in which the victims will likely be exposed to chemicals in the form of vapor or gas, the personal decon kit will enable large numbers of ambulatory, minimally injured, or worried-well victims to remove their clothing in a public setting while protecting their privacy. After evacuation from the scene of the release of a gas or vapor and once the clothing is removed, the chemical is essentially eliminated (see decision tree below).[4]



In October 2001, the Aurora, Colorado emergency management agency utilized dry decon kits in their Domestic Preparedness Chemical Exercise under the supervision of the emergency management agency and the US Department of Justice. Ambulatory minimally ill and worried-well survivors were decontaminated in a matter of minutes using these Doffit Kits.[17] The procedure was well tolerated by the participants and greatly speeded up the decontamination process as seen in the photos below.

This process is neither "sterile" nor perfect. After a mass casualty HazMat exposure, some small amount of vapor might contact the gown or poncho-like garment, but it will more than likely blow away. Vapor and gas will permeate clothing in an area of high vapor concentration near the area of release. After the victim leaves the scene of high vapor or gas concentration, there will be no further contamination of the clothing, but there will continue to be an inhalational hazard. As the victim uses The Doffit Kit poncho to self-decontaminate after exposure to a gas or vapor, this effort will not contaminate the poncho. The vapor and gas molecules will move away from the victim. Remember, these victims have been triaged; they exhibit minimal or no signs of exposure and have likely been exposed to little or no chemical. Therefore, this is a reasonable compromise compared to mandatory water showering.

In any event, it is likely to be impossible to offer water decon to every victim in a mass casualty incident. To attempt to do so would put seriously ill victims who are non-ambulatory at greater risk since critical resources – both human and logistic -- would have to be directed towards the minimally ill and worried-well. In a mass casualty incident, it is reasonable to offer this high level of decon only to those who might benefit most.[15, 18]

Dry decon can be achieved at the scene or the hospital. Local businesses, airports, schools, building security, police, fire, EMS, and hospital triage can all perform decon with this modality.

Summary

Communities must develop the capacity to evaluate, triage, decontaminate, and treat victims of a terrorist attack. This planning should be included in a generic mass casualty plan that enables community response to an "all-hazards" threat. Soft targets can participate in the community response by enabling security personnel to exercise and train with local first responders. Soft targets can develop an evacuation plan and decontamination plan consistent with the community mass casualty plan. Tabletop drills and hands-on exercises will assist in this effort.

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